

Workshop #3: Class and Object

Learning Outcomes:

Upon successful completion of this workshop, you will have demonstrated the abilities to:

- Design and implement a class.
- Create an object from a class
- Describe to your instructor what you have learned in completing this workshop.

Requirements:

Part 1: [2 points]

To complete this task you should read and study the lecture [Encapsulation](#)

-Create a new project named “**CarManager**”. It contains the file **Car.java** and **Tester.java**.

-In the file Car.java, you implement the Car class base on the class diagram as below:

Car
<div><div>-Colour: String</div><div>-EnginePower:int</div><div>-Convertible: boolean</div><div>-ParkingBrake: boolean</div></div>
<div><div>//constructors</div><div>+Car()</div><div>+Car(String Colour, int EnginePower, boolean Convertible, boolean ParkingBrake)</div><div>//getters</div><div>+getColour():String</div><div>+getEnginePower():int</div><div>+getConvertible(): boolean</div><div>+getParkingBrake(): boolean</div><div>//setters</div><div>+setColour(String colour):void</div><div>+setEnginePower(int EnginePower):void</div><div>+setConvertible(boolean Convertible): void</div><div>+setParkingBrake(boolean ParkingBrake): void</div><div>//other logic methods</div><div>+pressStartButton():void</div><div>+pressAcceleratorButton():void</div><div>+output(): void</div></div>

- Default constructor: to assign all fields to empty values
- Constructor with parameters: to assign all fields to input parameters
- Getters: to return the value of a field
- Setters: to change the value of a field
- The method pressStartButton(): print out the message “You have pressed the start button”

- The method `pressAcceleratorButton()`: print out the message “You have pressed the Accelerator button”
 - The method `output()`: print out values of all fields
- In the file “Test.java”. you type like as follow:

```
public class Tester {
    public static void main(String[] args) {
        Car c=new Car();
        c.pressStartButton();
        c.pressAcceleratorButton();
        c.output();

        Car c2=new Car("red", 100, true, true);
        c2.pressAcceleratorButton();
        c2.setColour("black");
        System.out.println("Colour of c2:" + c2.getColour());
        c2.output();
    }
}
```

- Run the method main to see the output

Part 2: Find classes and use UML to draw class structure [3 points]

Problem: Mr. Hung is the owner of the shop that sells guitars. He wants you to build him a shop management app. This app is used for keeping track of guitars. Each guitar contains serialNumber, price, builder, model, back Wood, top Wood. The guitar can create a melodious sound. The shop will keep guitars in the inventory. The owner can add a new guitar to it, he search also the guitar by the serialNumber.

Requirement: Write your paper down classes in the problem and use UML draw class structure.

Note: show members of a class: fields and methods

Do it yourself before getting help

Guideline:

Apply design guideline :

- Main nouns: Guitar
- Auxiliary nouns describe details of the guitar: serialNumber, price, builder, model, back Wood, top Wood.
- Verbs describe behaviors of the guitar: create Sound

Continue finding other nouns

- Main nouns: Inventory
- Auxiliary nouns describe details of the inventory: the list(array) of guitars
- Verbs describe behaviors of the inventory: add a new guitar, search the guitar by serialNumber.

Using UML to draw a class diagram

Part 3: only implement the Guitar class [4 points].

Step by step workshop instructions:

- Create a new project named “**workshop3**”
- In the project, create a new file named “**Guitar.java**”
 - o Declare fields with access modifier as private: String serialNumber, int price, String builder, String model, String backWood, String topWood
 - o Declare and implement methods with access modifier as public:
 - public Guitar() {...} : to assign all fields to empty values
 - public Guitar(String serialNumber, int price, String builder, String model, String backWood, String topWood) {...}: to assign all fields by input parameters
 - public String getSerialNumber(){...}: return the value of the field serialNumber.
 - public void setSerialNumber(String serialNumber){...}: if the input parameter is not empty then assign it to the field serialNumber.
 - Implement getter/setter of all other fields
 - public void createSound(){...}: in the method, invoke all getters and use System.out to print out values after getting.
- In the project, create a new file named “**Tester.java**. Create the method main in here, you type:

```
public class Tester {  
    public static void main(String[] args) {  
        Guitar obj1=new Guitar();  
        Guitar obj2=new Guitar("G123",2000,"Sony","Model123","hardWood","softWood");  
        System.out.println("State of obj1:");  
        obj1.createSound();  
        System.out.println("State of obj2:");  
        obj2.createSound();  
  
        System.out.println("set price = 3000 of obj1");  
        obj1.setPrice(3000);  
        System.out.println("get price of obj1:" + obj1.getPrice() );  
    }  
}
```

The output is:

```
Output - workshop1 (run)
run:
State of obj1:
serialNumber:null
price:0
builder:null
model:null
backWood:null
topWood:null
State of obj2:
serialNumber:G123
price:2000
builder:Sony
model:Model123
backWood:hardWood
topWood:softWood
set price = 3000 of obj1
get price of obj1:3000
BUILD SUCCESSFUL (total time: 0 seconds)
```

Part 4: Draw the memory map when the program runs [1 point]

Explain step by step what happened when the program runs and answer some questions.

- What is stored in the static heap, stack, dynamic heap?
- What are objects in the program?
- What is the state of obj1, obj2?
- Do you access all fields of obj1 in the class Tester.java? Why?
- What is the current object when the program runs to the line "obj2.createSound();"?
- In the method main, can you use the keyword "this" to access all fields of obj2? Why?